

CHAPTER 8

RESPONSE PLANNING GUIDANCE

8.0 Introduction

An effective flood warning system must include a response plan which shows that the community has procedures for ensuring effective evacuations and that actions are taken to reduce property damages. A response plan should cover the following elements:

- Warning Dissemination
- Evacuation and Rescue
- Damage Reduction
- Recovery
- Public Information
- Plan Implementation
- Plan Maintenance

The following sections have been abstracted and modified from the "Guide for Flood and Flash Flood Preparedness Planning²" dated May 1977. Some or all of the details in each section may be relevant to your local needs depending on the size and scope of your LFWS.

8.1 Warning Dissemination Element

Planning Objective: To disseminate warnings which are accurate, timely, and reliable.

1. Establish procedures for distributing warnings and advisories which:
 - a. ensure prompt attention to information concerning flood threats;
 - b. specify what types of warnings are issued for various possible conditions;
 - c. ensure that product content is commensurate with the expected severity of the flood;
 - d. ensure that the NWS warnings are disseminated to need-to-know individuals in a timely manner; and
 - e. ensure that locally generated advisories are coordinated with NWS.
2. Establish procedures for disseminating information concerning potential flood threats to special need-to-know recipients which:
 - a. identify special recipients who are to be notified under various possible conditions of flood threat;
 - b. describe the means of communications to be used in alerting each special recipient; and

² Prepared for the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Disaster Preparedness Staff by H. James Owen, Consulting Engineer.

- c. specify record keeping, acknowledgment, and other processes to assure notices are given and received.
- 3. Establish procedures for the dissemination of warnings to the general public which:
 - a. are adequate to assure all affected persons receive warnings on a timely basis, notwithstanding telephone and power failures;
 - b. provide for various levels of warning appropriate to the immediacy and seriousness of the flood threat;
 - c. specify the conditions under which each means of warning dissemination will be used;
 - d. describe the process by which parties responsible for each means of dissemination are instructed to begin distributing warnings; and
 - e. take into consideration the time of day, day of week, or seasonal factors affecting the need for or means of warning dissemination.

8.2 Evacuation and Rescue Element

Planning Objectives: To prevent the loss of life due to flooding or to flood-related causes.

A. Evacuation Area Identification Task

- 1. Identify areas that will be inundated at each potential level of flooding due to:
 - a. overbank flows; and
 - b. entry of floodwaters through sewers, drainage channels, or other means of access.
- 2. Identify areas which will be inundated due to internal drainage or ponding unrelated to flood height in streams.
- 3. Identify areas requiring evacuation for reasons other than inundation including:
 - a. loss of access or escape routes;
 - b. loss of curtailment of utility or other emergency services; and
 - c. site-specific problems.

B. Evacuation Procedures Development Task

- 1. Select evacuation destinations for each area to be evacuated which are:
 - a. safe from flooding and other related hazards;
 - b. easily identified to the public;
 - c. within time and distance commensurate with the warning time; and
 - d. suitable for use for the expected duration of flooding.
- 2. Identify best available evacuation routes which are:
 - a. safe from early flooding due to urban drainage or other impediments;
 - b. passable in all weather; and
 - c. adequate to handle expected traffic.
- 3. Establish priorities for evacuation which take into account:
 - a. time of flooding with respect to other areas;
 - b. severity of flooding; and

- c. loss of escape routes.
- 4. Establish procedures for carrying out evacuation which are consistent with the warning time available including:
 - a. ensuring that the affected public is advised of the need to evacuate, safe destinations, routes, and time available for evacuation;
 - b. providing general assistance in transportation and in preparing homes and businesses for evacuation;
 - c. providing special assistance to those having unusual evacuation needs;
 - d. assuring evacuation is complete;
 - e. establishing traffic controls to prevent accidental entry into dangerous areas, identifying evacuation routes, and facilitating evacuation traffic; and
 - f. establishing surveillance over the evacuation area to ensure safety of the area.

C. Reception Center Operations Task

- 1. Estimate the duration, damage, and population affected in the case of a severe flood and determine reception center requirements including:
 - a. number of evacuated persons likely to require emergency overnight housing;
 - b. number of meals to be served;
 - c. type and extent of medical or other care that may be required;
 - d. required services, equipment, and supplies for operation; and
 - e. required personnel for operation.
- 2. Select reception centers which:
 - a. are safe under conditions of severe flooding;
 - b. have or can be provided with necessary equipment and services;
 - c. provide sufficient space for required activities;
 - d. are available on short notice for the required duration; and
 - e. are readily identifiable to the public and accessible from all areas.
- 3. Establish procedures for the operation of reception centers including:
 - a. basis on which reception center operations will be activated and terminated;
 - b. source and means of providing necessary supplies, equipment, and services;
 - c. allocation of space for reception center functions; and
 - d. provision of temporary assistance and information on long-term recovery aid.

D. Emergency Action Task

- 1. Evaluate the areas subject to flooding or isolation during flood events with respect to the types of emergency activities which may be required including:
 - a. emergency evacuation of persons from dangerous areas;
 - b. emergency provision of medical attention, fire control, or other assistance;

- c. emergency operation or curtailment of power, water, gas, and other services;
 - d. control or containment of toxics, explosive gases, and other dangerous commodities; and
 - e. search for survivors.
2. Determine requirements for conducting emergency actions including:
- a. personnel;
 - b. transportation;
 - c. heavy-duty equipment (e.g., boats, trucks, earthmovers, and others); and
 - d. portable hand tools and other equipment.
3. Establish procedures for carrying out emergency actions including:
- a. organization of rescue squads;
 - b. placement of personnel and equipment for conducting emergency activities;
 - c. coordination arrangements for identifying needs for assistance and responding to calls; and
 - d. maintenance of communications.

8.3 Damage Reduction Element

Planning Objectives: To reduce public and private property damages from flooding or flood-related causes.

A. Flood-Fighting Task

- 1. Identify needed flood-fighting actions to reduce overflow, seepage, and other types of flooding as well as erosion due to floodwaters including:
 - a. assuring floodgates or sewer outlets are closed;
 - b. temporary heightening of levees or floodwalls;
 - c. securing of openings in levees and other embankments;
 - d. containing overflows through manholes and other openings in the sewer system;
 - e. pumping of internal drainage waters; and
 - f. control of erosion at bridges, levees, building foundations, and roadway embankments.
- 2. Establish flood-fighting procedures to control overflow, seepage, or other types of flooding with respect to:
 - a. locations where each action is to be carried out;
 - b. maintaining surveillance to determine the need for personnel, equipment, and further actions;
 - c. priority for accomplishment; and
 - d. extent of action required for various flood heights.
- 3. Establish procedures for the evacuation or temporary removal and relocation of automobiles, furniture, valuables, clothes, business and personal records, machinery, and other movable property to reduce damage including:

- a. identification of types of action required at various locations and expected flood heights;
- b. arrangements for the provision of labor and transportation assistance; and
- c. identification of safe locations for storage of property.

B. Utility Management Task

- 1. Establish procedures for the curtailment of utility services to flooded areas including:
 - a. need for curtailment by area or individual property for each flood height;
 - b. means for accomplishing curtailment (i.e., homeowner, utility staff, or other); and
 - c. preparations to be made by property owner (within allowable time) prior to evacuation to minimize damage and facilitate the eventual return of services.
- 2. Establish utility operation procedures to be used immediately prior to and during floods to:
 - a. minimize losses and risks caused by damaged utility systems;
 - b. reduce damage done to utility equipment, supplies, and operational capabilities; and
 - c. maintain necessary utility services to vital community facilities.

C. Traffic Control Task

- 1. Identify needs for traffic control prior to, during, and immediately after floods including:
 - a. preventing accidental travel in areas which are or will be flooded;
 - b. establishing evacuation routes and speeding evacuation traffic;
 - c. facilitating access to evacuation areas for transportation, rescue, and other essential traffic;
 - d. preventing use of damaged roadways and bridges; and
 - e. controlling access to damaged areas.
- 2. Establish procedures for traffic control which:
 - a. identify areas to be controlled at each expected flood height;
 - b. specify locations where traffic control is to be established;
 - c. identify detours or types of control to be effected;
 - d. specify placement of personnel, barricades, and signs to effect necessary control and means of enforcement; and
 - e. restrict access to flood-damaged areas to residents and other authorized persons.

D. Maintenance of Vital Services Task

1. Identify police, fire, medical, and other vital community services and facilities with respect to:
 - a. location;
 - b. vulnerability to interference by inundation, loss of access, or communications;
 - c. interdependencies on other services and facilities including utilities;
 - d. temporary floodproofing or other actions required to prevent the loss of service or function; and
 - e. the need for and means of providing auxiliary power, heat, water, sewage disposal, and other services necessary for continued operation of vital facilities.
2. Establish operational procedures for police, fire, utility repair, rescue, medical, and other services prior to and during floods including:
 - a. placement of equipment and personnel to prevent loss of access due to flooding of roads and underpasses or failure of bridges;
 - b. means of relaying calls for assistance and coordinating responses; and
 - c. alternate routes for entering areas where traffic is controlled and avoiding evacuation routes.
3. Establish procedures for evacuation or protection of important records and documents located in areas subject to flooding including those relating to:
 - a. vital statistics;
 - b. tax and payroll information;
 - c. court records;
 - d. utility records;
 - e. property ownership; and
 - f. business records.

8.4 Recovery Element

Planning Objectives: To initiate and carry out post-flood actions to maintain public health, return community services to normal at the earliest possible time, provide aid, and assist in recovery operations.

A. Maintenance of Public Health Task

1. Establish procedures for handling of the dead including:
 - a. morgue location and method of operation;
 - b. handling of personal effects; and
 - c. identification and release of bodies.
2. Establish procedures for actions to preserve public health including:
 - a. provision of emergency medical services and care for injured persons;
 - b. procedure for locating missing persons and providing information to friends and relations;
 - c. collection and destruction of contaminated foodstuffs;

- d. disinfection of private water supply sources and systems;
- e. inoculations and other preventive medical care;
- f. disease control; and
- g. control of insects, rodents, and other pests.

B. Return of Services Task

- 1. Establish procedures for actions to resume provision of utility services including:
 - a. preparations to be made by property owners;
 - b. system preparations including decontamination of water supplies;
 - c. sequence for returning services; and
 - d. priority for resuming services.
- 2. Establish procedures for returning to normal traffic patterns including:
 - a. evaluation of road and bridge safety;
 - b. debris clearance; and
 - c. priority for providing access.

C. Rehabilitation and Repair Task

- 1. Establish procedures for post-flood cleanup including:
 - a. clearing, collecting, and disposing of debris and discarded goods;
 - b. street washing;
 - c. pumping basements; and
 - d. returning material previously relocated for safekeeping.
- 2. Establish procedures for management of damaged structures including:
 - a. procedures for identification and evaluation of damage; and
 - b. demolition or temporary repair of hazardous buildings.
- 3. Identify the sources and programs for recovery assistance and the means of obtaining each including:
 - a. volunteer organizations;
 - b. mutual aid agreements;
 - c. state assistance; and
 - d. Federal assistance.
- 4. Establish procedures for mobilizing assistance from each available source including:
 - a. conditions under which requests for assistance will be made;
 - b. channels to be followed in requesting assistance; and
 - c. preparation of necessary requests, disaster declarations, or other documentation required as a condition of assistance.

8.5 Public Information Element

Planning Objectives: To develop community awareness and understanding of the flood hazard and to prepare for the accurate and timely provision of information during flood emergencies.

A. Community Education Task

1. Prepare the materials for and carry out a continuing public information program, including letters to residents in evacuation areas to increase community awareness of floods and evacuation area residents' knowledge with respect to:
 - a. the source, nature, frequency, and potential severity of floods;
 - b. the community's system for flood recognition and dissemination of warnings to the public;
 - c. the meaning of various types of warning announcements, siren signals, and/or evacuation notices;
 - d. the areas likely to be inundated or evacuated at each level of expected flooding;
 - e. procedures for evacuation including preparations for evacuation, routes, safe destinations, and identification of reception centers;
 - f. actions which can be taken by property owners to reduce damages, including moving furniture and valuables, curtailing electrical power and gas service, and temporary floodproofing;
 - g. means of requesting identification as a special warning recipient or receiving special assistance in evacuation; and
 - h. safety and remedial actions to be taken when returning to flood-damaged buildings.
2. Prepare and carry out a continuing program to provide technical information to those wishing to employ temporary floodproofing measures or needing to develop more detailed subplans for warning dissemination, evacuation, and damage reduction including:
 - a. identification of areas where the depth and velocity of expected flooding and opportunities for egress enable the use of temporary floodproofing measures;
 - b. procedures for temporary floodproofing;
 - c. relation between forecast flood heights and on-site depths; and
 - d. guidelines and criteria for warning dissemination and evacuation plans for hotels, motels, hospitals, and/or other facilities requiring more detailed arrangements.

B. Emergency Information Task

1. Identify the types of emergency information to be conveyed to the public in the period prior to, during, and immediately following a flood including:
 - a. early watches, warnings, and evacuation notices, worded appropriately to obtain maximum public response;
 - b. information on actions to be taken, location of safe areas and areas to be avoided, location of reception centers, and ways of obtaining emergency assistance;
 - c. actions being taken or to be taken to deal with the flood;
 - d. calls for labor, equipment, or other types of assistance needed for evacuation, damage reduction, and/or recovery activities; and

- e. information concerning sources and availability of recovery assistance.
- 2. Identify the means and procedures to be used in communicating each type of information with respect to:
 - a. form and content of each type of message;
 - b. handling of flood warnings and other related messages;
 - c. source and verification of messages; and
 - d. interfacing of communications equipment.
- 3. Prepare warning announcements for use in various potential circumstances and expected flood heights which:
 - a. provide specific information and instructions;
 - b. reference an authoritative and familiar source; and
 - c. ensure an immediate and adequate response to warning messages by the public and responsible officials by considering the various factors governing warning confirmation and warning belief.

8.6 Plan Implementation Element

Planning Objectives: To develop the administrative arrangements necessary for effective implementation of the flood preparedness plan.

A. Resource Identification Task

- 1. Identify type and amount of resources required for implementing the plan including:
 - a. technical, administrative, and other personnel;
 - b. equipment and supplies; and
 - c. facilities.
- 2. Identify the sources of personnel, equipment, supplies, and facilities for implementing the plan including:
 - a. community resources;
 - b. private resources;
 - c. assistance through mutual aid agreements; and
 - d. Federal and/or state assistance.

B. Responsibility Allocation Task

- 1. Evaluate each aspect of plan implementation with respect to:
 - a. actions requiring detailed and specific assignments of responsibility; and
 - b. actions suitable for assignment on an organizational basis.
- 2. Assign responsibility for implementation of each aspect of the plan including:
 - a. instructions as to how, when, and by whom implementation is to be assured;
 - b. requirements for any necessary subplans or supplemental procedures; and
 - c. establishment of a chain of command to ensure plan implementation will proceed in the absence or incapacity of key personnel.

C. Coordination Task

1. Establish procedures for coordination of local governmental actions through an emergency operations center, if available, or other mechanisms including:
 - a. identification of responsibilities to be assigned to the center;
 - b. operational procedures for staffing and operation of the center to carry out the assigned responsibilities; and
 - c. procedures for activation and termination of the center.
2. Establish necessary arrangements, including mutual aid agreements, for use of facilities, equipment, personnel, and services necessary for implementation of the plan including:
 - a. location of river and rainfall gages, participation of observers, and receipt of information from upstream areas;
 - b. land rights for flood fighting and other purposes;
 - c. use of reception centers, hospitals, and areas for property storage;
 - d. use of vehicles for evacuation or movement of property;
 - e. participation of volunteer organizations; and
 - f. provision of necessary supplies, materials, construction equipment, and other items.
3. Establish procedures to coordinate the local plan fully with state and other local plans for emergency operations including:
 - a. integration with regional or statewide flood warning systems and communication networks, state flood disaster plans, and other local natural disaster plans;
 - b. coordination of evacuation plans with those for flood control, particularly where closure of floodgates in levees or floodwalls may affect escape routes; and
 - c. coordination with the NWS with respect to use of all available information and issuance of warnings.
4. Establish procedures to guide and coordinate more detailed site-specific planning for warning dissemination, evacuation, and damage reduction in public and private buildings including:
 - a. process for identifying locations where such plans are necessary;
 - b. minimum elements and appropriate level of detail to be included in planning; and
 - c. provision of technical assistance in planning.

8.7 Plan Maintenance Element

Planning Objectives: To update, extend, and improve the flood response plan and to ensure readiness for executing the plan.

A. Plan Updating Task

1. Establish procedures and schedules for plan contents subject to rapid obsolescence including:
 - a. addresses, telephone numbers, and names of key participants;
 - b. assignments of responsibility;
 - c. changes in flood potential;
 - d. areas requiring evacuation;
 - e. availability of facilities for reception centers;
 - f. evacuation routes and priorities;
 - g. flood-fighting requirements;
 - h. utility extensions or system modifications; and
 - i. traffic control requirements.
2. Establish procedures for updating of plan contents based on specific events such as:
 - a. construction of or modification in the operation of upstream water control structures which affect the height, severity, or time of flooding;
 - b. natural or unplanned events which modify the flood potential; and
 - c. construction or modification in the operation of facilities in or downstream of the community which increases the height, severity, or duration of floods.

B. Plan Improvement Task

1. Describe needed and planned extensions of the warning system and response plan including:
 - a. coverage of additional area; and
 - b. incorporation of elements, tasks, and subtasks omitted from the initial plan.
2. Describe needed and planned refinements to the warning system and response plan including:
 - a. provision of additional observers, gages, and flash flood alarms to improve the flood recognition system;
 - b. more detailed identification of areas to be evacuated;
 - c. strengthening of communications involved in all aspects of the plan; and
 - d. development of additional subplans for various affected organizations and locations.
3. Establish procedures for the critical evaluation of performance in real and simulated implementation of the plan including:
 - a. process for initiation, organization, and conduct of the evaluation; and
 - b. process for modification of the plan based on findings of the evaluation.

C. Plan Practice Task

1. Establish procedures and schedules for testing those aspects of the flood warning system and response plan which are susceptible to periodic use such as:
 - a. procedures for communication with observer networks, the NWS, and other Federal offices, special warning recipients, organizations, and officials responsible for warning dissemination and plan execution, and others as may be appropriate;
 - b. communications equipment including sirens, radio transmitters and receivers, flash flood alarm circuits, and others, with particular attention to battery-powered equipment;
 - c. auxiliary sources of electrical power and other services;
 - d. procedures for activating the emergency operations center, sending and receiving observer reports, handling messages, preparing forecasts, disseminating warnings, placing equipment and personnel for evacuation and rescue, protecting vital facilities, and other steps in execution of the plan;
 - e. availability and operational status of equipment for evacuation, rescue, and damage-reduction activities; and
 - f. availability and procedures to use key maps, lists, and other important plan documentation.
2. Establish procedures and schedules for periodic simulation of those aspects of the warning system and response plan not susceptible to direct testing such as:
 - a. decisions to issue warnings or direct evacuation;
 - b. evacuation;
 - c. implementation of traffic control procedures;
 - d. activation of reception centers;
 - e. curtailment of utility services; and
 - f. procedures for rescue, handling of injuries and casualties, and public health measures.